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NICOMACHE OHTAI, NEW SPECIES (POLYCHAETA: MALDANIDAE) COLLECTED FROM THE HATSUSHIMA COLD-SEEP IN SAGAMI BAY

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Abstract.—A new maldanid polychaete species, *Nicomache ohtai*, is described from the Hatsushima cold-seep in Sagami Bay at a depth of 1163 m. The new species is very close to *N. venticola* from the hydrothermal vents of the northeastern Pacific, however it differs from the latter in having up to 19 rostrate uncini with 3–4 apical teeth in each neuropodium instead of up to 10 uncini with 2–3 teeth.

Studies on Japanese cold-seeps began as a French-Japanese cooperative project using the French deep-sea submersible *Nautile* in 1984 and were followed by multidisciplinary surveys using the Japanese submersible *Shinkai 2000* (Laubier et al. 1986, Miura 1988a). The collections from these programs have provided some interesting materials for polychaete taxonomy. To date, all of the polychaetes that have been described are directly associated with a larger host species at the seep sites (Miura 1988b; Miura & Laubier 1989, 1990). These associations include *Protomystides hatsushimaensis* attached to the openings of vestimentiferan tubes and species of the Nautiliniellidae living in the mantle cavities of bivalve mollusks. Free-living polychaetes have not been reported from these Japanese cold-seeps. However the second author did collect maldanid polychaetes within tubes that were attached to a dead shell of *Calyptogena soyoae* at 1163 m off Hatsushima.

Early important studies on the family Maldanidae were made by Arwidsson (1907, 1911a, 1911b). Imajima & Shiraki (1982) reviewed all Japanese maldanid polychaetes and reported 37 species including four species of the genus *Nicomache*. Intact specimens are required for the identification of maldanids because of the morphological importance of the posterior body region. In this study, a new species of the genus *Nicomache* is described based on intact specimens of some mature males and females.

The types are deposited in the National Science Museum, Tokyo (NSMT), the Japan Marine Science and Technology Center (JAMSTEC), and the National Museum of Natural History, Smithsonian Institution (USNM).

Genus *Nicomache* Malmgren, 1865
Nicomache ohtai, new species
Figs. 1–3

Material examined.—Western North Pacific, cold-seep communities off Hatsushima, Sagami Bay, Japan. DSRV *Shinkai 2000* Dive 450, 21 Oct 1989, 35°00.0′N, 139°13.5′E, 1163 m, collector J. Hashimoto, holotype (NSMT-Pol. H-326), 3 paratypes (USNM 127962), 4 paratypes (JAMSTEC); Dive 451, 22 Oct 1989, same site, collector K. Fujikura, 1 paratype (JAMSTEC); unmanned submersible *D3K*, Dive at Okinoyama Seep, Sagami Bay, 19 May 1989, 34°58.2′N, 139°31.4′E, 1116 m, 2 paratypes (JAMSTEC).

Description.—Complete paratypes 64–151 mm long, 1.7–2.8 mm wide, with 31–35 setigers (Table 1). Holotype 187 mm long, 3.5 mm wide including parapodia, with 32 setigers; with a single achaetous preanal

Table 1.—Measurement of type specimens of *Nicomache ohtai,* new species.

Specimen number	Number of setigers (achaetous rings)	Number of anal papillae	Body length (mm)	Body width (mm)	Sex
Dive 450					
1 (Holotype)	32 (+1)	22	187	3.5	female
2	32 (+1)	23	125	2.8	female
3	32 (+1)	18	120	2.4	?
4	32 (+1)	25	110	2.2	male
5	32 (+2)	24	151	2.6	male
6	35 (+0)	20	130	2.3	?
7	31 (+1)	18	139	2.5	?
8	33 (+0)	21	104	2.3	?
Dive 451					
1	31 (+1)	23	93	2.8	male
D3K					
1	32 (+1)	19	64	1.7	?
2*	25+	25	72	2.0	?
n	10	10	10	11**	
$\bar{x}$	32.2	21.3	122.3	2.46	
SD	1.1	2.5	33.5	0.47	

* With regenerated caudal end.
** Specimen *D3K* No. 2 included.

glandular ring well stained by Methyl Green. Color in alcohol pale, with slightly dark brown to reddish brown swollen areas on anterior and posterior segments.

Prostomium broadly rounded anteriorly; cephalic keel well defined, arched; nuchal slits situated on both sides of keel, curved, diverging anteriorly; mouth rounded, with thick lip (Fig. 1a, b).

Setigers 1–6 slightly longer than wide, flaring anteriorly, without collars (Fig. 1c); median segments very long, sometimes more than 4 times longer than wide; posterior setigers short, with well-defined glandular pads (Fig. 1d, e). Pygidium with dorsally shortened anal funnel bearing 22 papillae (Fig. 1d–f).

Parapodia biramous; first 3 neuropodia with 2–6 stout acicular spines (Fig. 2a, Table 2); following neuropodia with 9–12 rostrate uncini in anterior 2 and posterior 5 setigers, with 13–19 in middle 25 setigers (Fig. 3). Each uncinus with 3–4 teeth above main fang, numerous accessory spines on convex side and several subrostral fibrils (Fig. 2b). Notopodia with stout bilimbate capillaries (Fig. 2d) and short thin spinulose capillaries (Fig. 2c) on all setigers; with spirally spinulose capillaries (Fig. 2e) and a few short slender wavy capillaries (½ length of stout capillaries) on median and posterior notopodia (Fig. 2g).

Tube covered with coarse sand grains and mud.

Variation.—The total number of setigers varies from 31 to 35 ($\bar{X} = 32.2$) in 10 complete specimens, with 6 having 32 (Table 1). In an exceptional paratype (Dive 450, No. 6) with 35 setigers, the last setigerous segment is merely recognized by the presence of its right parapodium. Thus the number is rather constant in the species.

Some early authors mentioned the number of preanal segments (glandular pads or rings) as an important character (e.g., Imajima & Shiraki 1982: the key to the species of the genus *Nicomache*), however the number is variable (0–2) in this new species. The

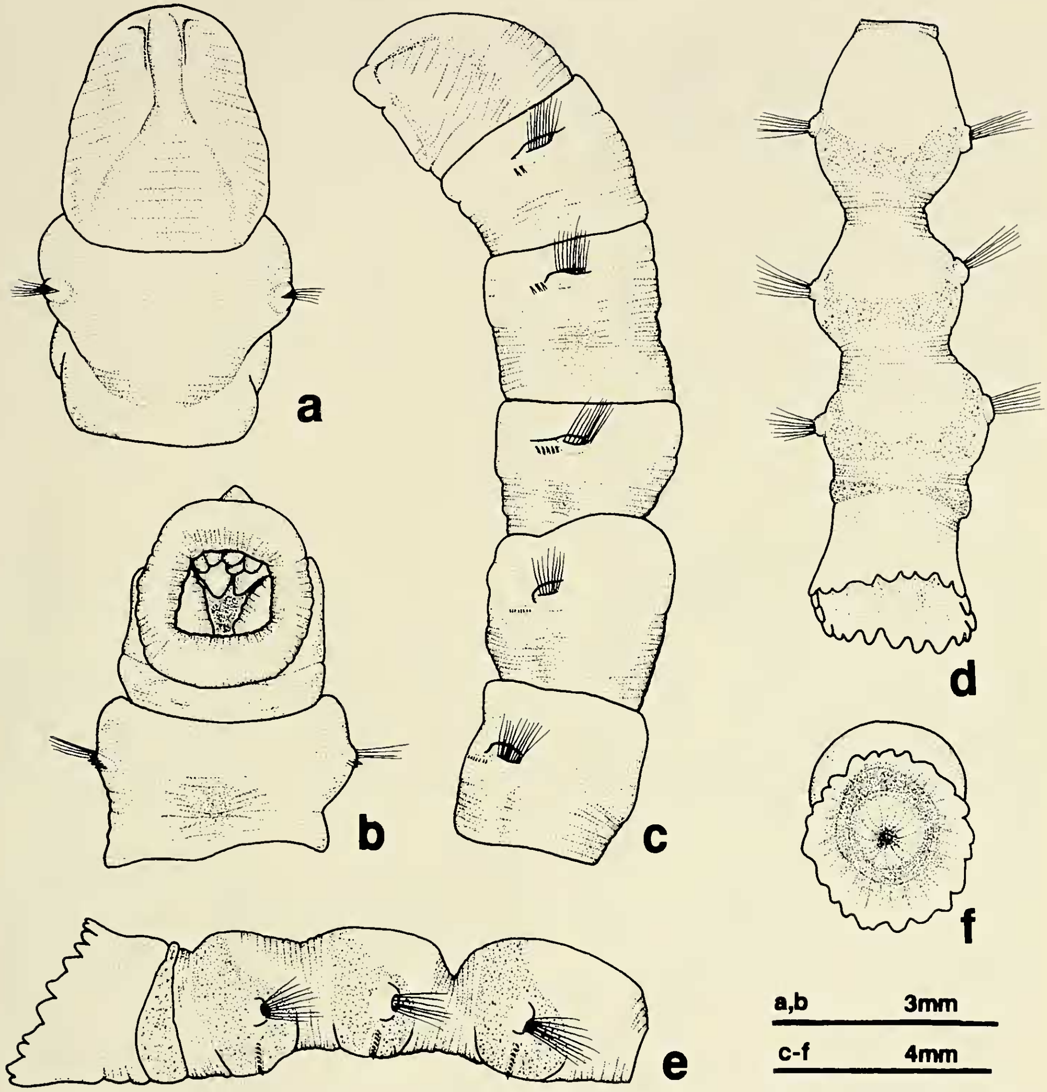

Fig. 1. *Nicomache ohtai* (Holotype): a, Anterior end, dorsal view; b, Same, ventral view; c, Anterior segments, lateral view; d, Posterior segments, dorsal view; e, Same, lateral view; f, Pygidium, posterior view.

number of papillae on anal funnel ranges from 18 to 25 ($\bar{X} = 21.3$, $n = 10$), with each papilla being very broad and sometimes subdivided.

The number of anterior acicular spines per parapodium ranges from 2 to 7 with the majority from 3 to 6 (Table 2). The number increases in the three succeeding setigers. For example, the average numbers of spines per parapodium in 11 specimens are 3.5, 4.1 and 5.2 on setigers 1, 2 and 3, respectively. The number of anterior setae seems to depend on the body size, however only the correlation of the number of rostrate uncini on parapodium 4L with the body width is significant ($R = 0.87$, $P \leq 0.001$).

Biology.—On some posterior segments, the spirally spinulose capillaries were cov-

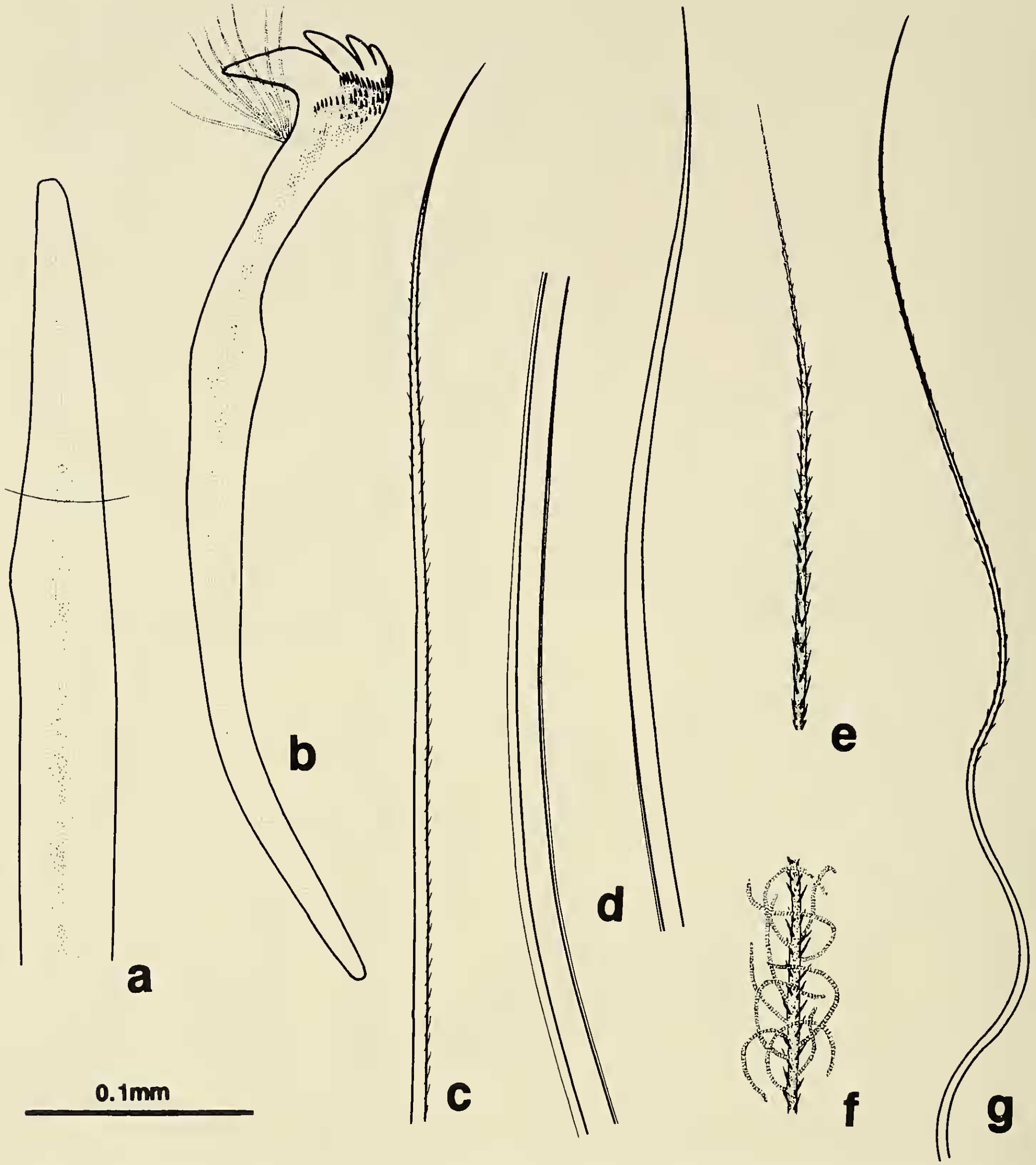

Fig. 2. *Nicomache ohtai* (Holotype): a, Acicular spine on setiger 1; b, Rostrate uncinus; c, Spinulose capillary; d, Bilimbate capillary; e, Distal end of spirally spinulose capillary; f, Part of same with *Beggiatoa*-like filaments; g, Short wavy capillary.

ered with numerous filaments (Fig. 2f), recalling the *Beggiatoa*-like bacteria found on some alvinellid polychaetes or on sediments of deep-sea hydrothermal vents (Desbruyères et al. 1985, Tunnicliffe et al. 1985).

Female specimens had oocytes in the coelom of mid-posterior segments. The oocytes are discoidal or hexagonal with the largest measuring about 150 μm × 50 μm.

Remarks.—In the genus *Nicomache,* 23 nominal species are recognized (Hartman 1959, Fauchald 1977, Blake 1985, Blake &

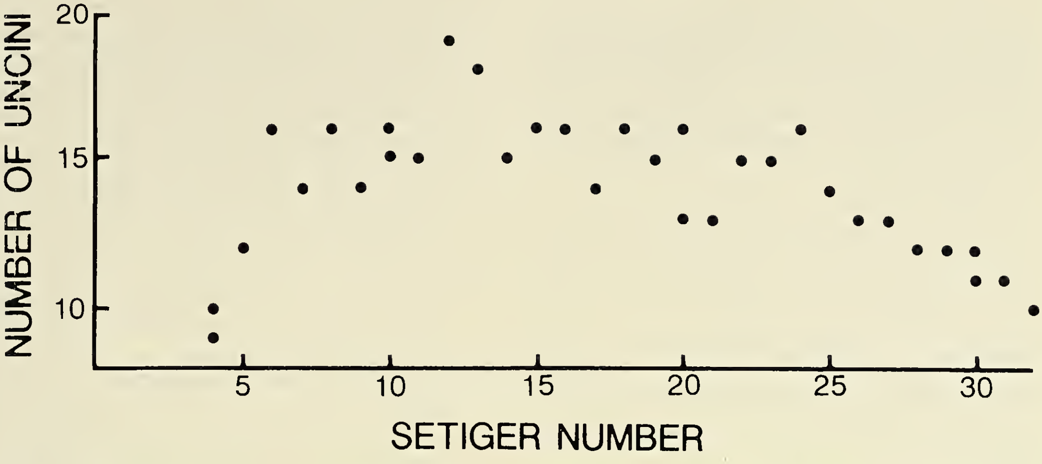

Fig. 3. Distribution of rostrate uncini in the holotype of *Nicomache ohtai,* new species.

Hilbig 1990). Most have 23 setigers or less and are easily distinguishable from *N. ohtai* which has more than 30 setigers. Two species have been described from deep-sea hydrothermal vents: *N. arwidssoni* Blake, 1985 and *N. venticola* Blake & Hilbig, 1990. *N. ohtai* is most similar to *N. venticola* in having 30 or more setigers, 22 anal papillae and up to 6 acicular spines in each of the first 3 setigers. *N. ohtai* differs from *N. venticola* in having up to 19 rostrate uncini with 3–4 apical teeth in each neuropodium instead of up to 10 uncini with 2–3 teeth and in the presence of the short wavy capillary instead of the absence. The absence of the long filamentous capillary in the two hydrothermal

Table 2.—Distribution of acicular spines and rostrate uncini (parenthesized numbers) on first four setigers in type specimens of *Nicomache ohtai,* new species.

Specimen number	Setiger number							
	1L	1R	2L	2R	3L	3R	4L	4R
Dive 450								
1	2	5	4	5	6	5	(10)	(9)
2	4	4	5	4	6	6	(9)	(7)
3	3	3	4	3	4	4	(7)	(6)
4	3	3	4	5	5	5	(7)	(7)
5	3	3	4	3	6	5	(8)	(8)
6	4	3	4	5	6	5	(8)	(6)
7	4	4	5	4	6	6	(8)	(10)
8	4	4	4	4	5	5	(7)	(7)
Dive 451								
1	4	4	6	4	6	7	(7)	(7)
D3K								
1	4	3	4	3	3	4	(6)	(6)
2	3	3	4	3	5	5	(6)	(6)
n	11	11	11	11	11	11	11	11
$\bar{x}$	3.5	3.5	4.4	3.9	5.3	5.2	7.5	7.2
SD	0.7	0.7	0.7	0.8	1.0	0.9	1.2	1.3

vent species was considered as an important character for separating them from other congeners (Blake 1985, Blake & Hilbig 1990). The presence of the short wavy capillary in *N. ohtai* is therefore thought to be an intermediate state between these two groups of species.

Nicomache mossambica Day, 1951 is another known species with more than 30 setigers. Both *N. mossambica* and *N. ohtai* have two or more acicular spines on the anterior three setigers, however the anal funnel of the former is cylindrical and differs from the dorsally shortened funnel of the latter.

Etymology.—The species is named in honor of Dr. S. Ohta of the Ocean Research Institute, University of Tokyo for his valuable advice on the sampling using submersibles.

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